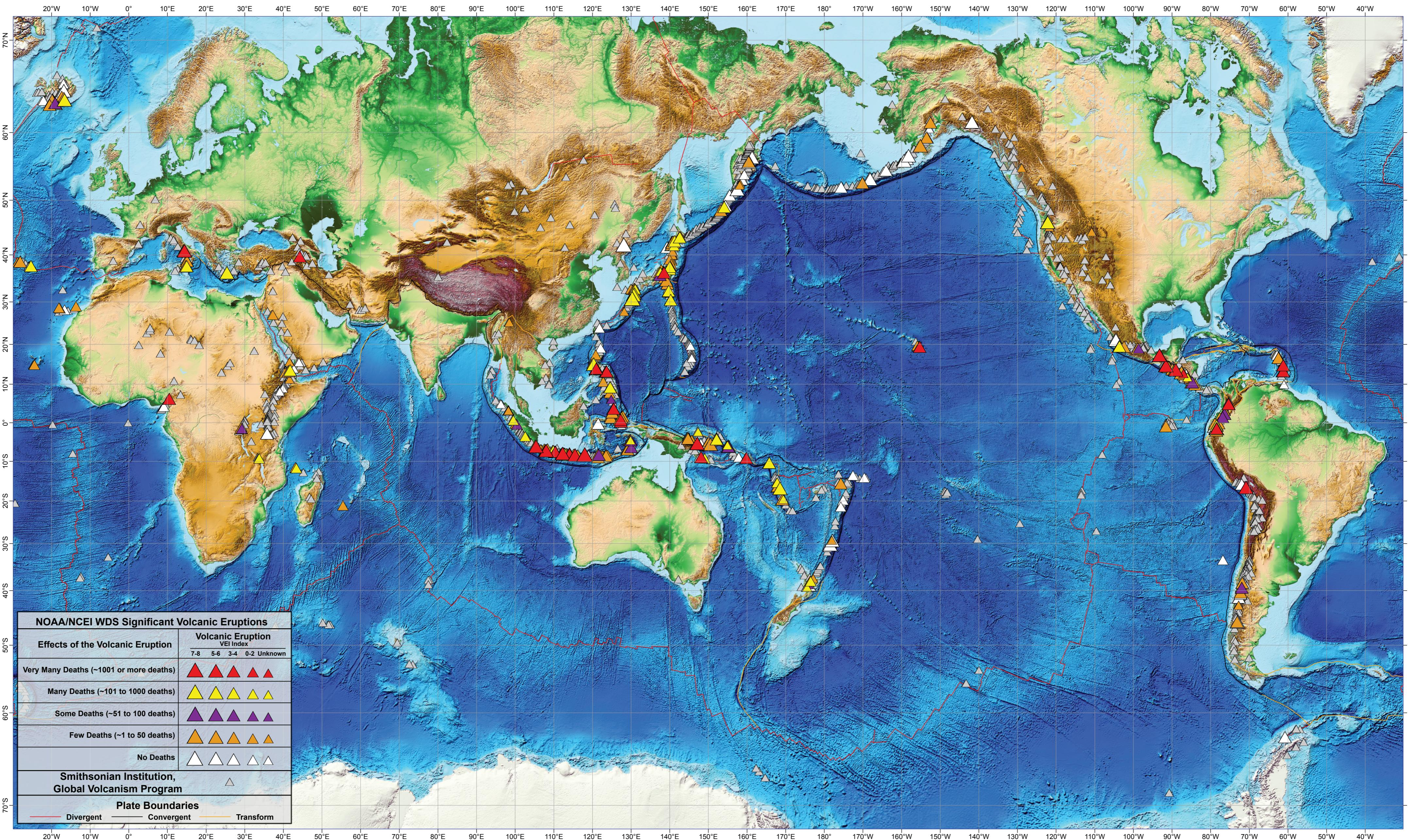


Significant Volcanic Eruptions 4360 B.C. to A.D. 2017



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NOAA's National Centers for Environmental Information (NCEI) and co-located World Data Service (WDS) for Geophysics and the International Tsunami Information Center (ITIC), a UNESCO/IOC-NOAA partnership, have collaborated to produce a map showing significant volcanic eruptions. The information comes from the NCEI Significant Volcanic Eruptions Database which includes volcanic eruptions from 4360 B.C. to A.D. 2017 meeting at least one of the following criteria: resulted in moderate damage (approximately USD \$1 million or more), caused fatalities, produced a large eruption with a volcanic explosivity index (VEI) of 6 or larger, generated a tsunami, or was associated with a major earthquake. VEI is a simple 0-8 index of increasing explosivity that combines quantitative data with descriptions from observers (Newhall and Self, 1982).

There are approximately 800 eruptions in the database. The global distribution of these eruptions is 24% Central and South Pacific, 17% East Asia, 16% Europe, 16% Southern Asia (including western Indonesia), 9% Central America and the Caribbean, 7% North America and Hawaii, 4% South America, 4% Africa, 2% Kamchatka and the Kuril Islands, and 1% Middle East. The majority of the volcanic eruption information comes from eyewitness observations that are now enhanced with satellite data. Dating methods (e.g., radiocarbon and tephrochronology) are used when there is an absence of human observations.

The total number of deaths due to volcanic eruptions is over 300,000 and the total damage is over USD \$7 billion (2017 dollars). These numbers are probably underestimates, however, since the actual numbers are unknown for many events. Tables 1 and 2 list the deadliest and largest (VEI ≥ 6) eruptions in the last 4,000 years. Eruptions can also generate deadly tsunamis (Table 3). For example, most of the 36,000 deaths from the 1883 Krakatau explosion resulted from the tsunami.

The events in the NCEI Significant Volcanic Eruptions Database were gathered from the Smithsonian Institution's Global Volcanism Program (GVP), the U.S. Geological Survey, volcano catalogs, national and government databases and reports, post-event reconnaissance reports, journal articles, newspapers, internet sources, email, and other documents. For a complete listing of references used to compile the database, please visit: <http://www.ngdc.noaa.gov/hazard/>.

Triangles on the map represent the location, VEI, and number of deaths for significant volcanic eruptions. Gray triangles represent all volcanoes that did not cause death or damage based on the GVP catalog.

References:

Newhall C. G., and S. Self. 1982. The volcanic explosivity index (VEI): an estimate of explosive magnitude for historical volcanism. *J Geophys Res (Oceans & Atmospheres)*, 87: 1231-38.

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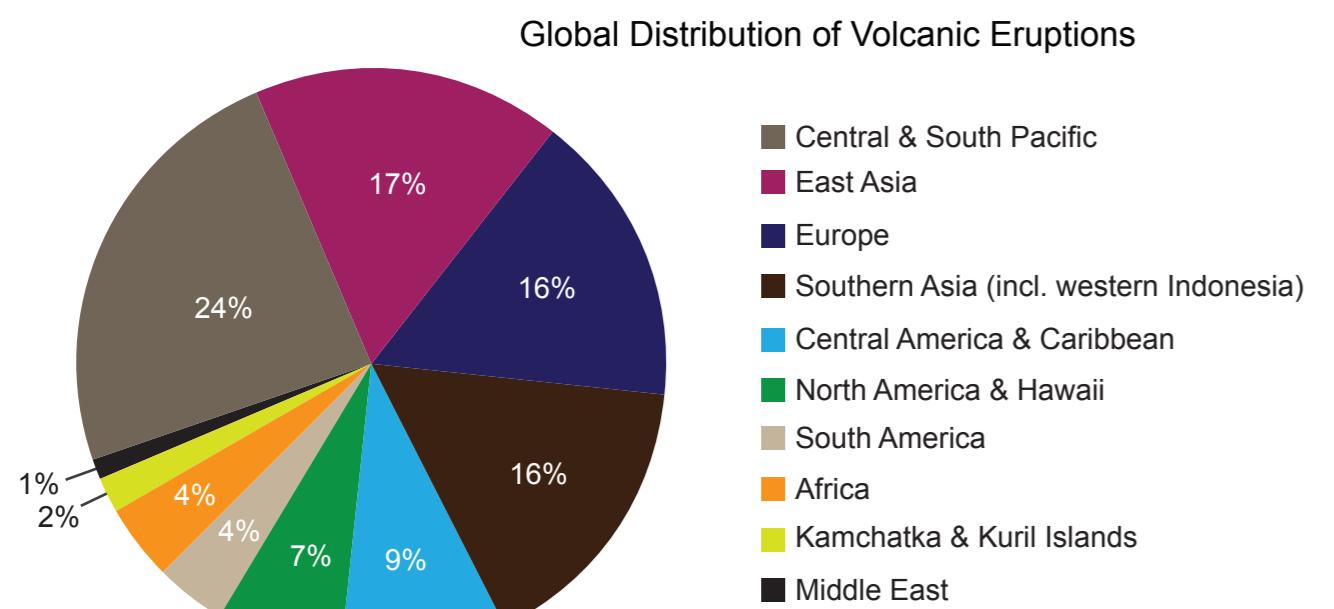


Table 1. Volcanic eruptions causing 1,000 or more deaths			
Date			Deaths
Year	Mon	Day	Name, Location
79	8	25	Vesuvius, Italy
450			Ilopango, El Salvador
1568			Savo, Solomon Islands
1586			Kelut, Java, Indonesia
1600	2	19	Huaynaputina, Southern Peru
1631	12	16	Vesuvius, Italy ^T
1638			Raung, Java, Indonesia
1640			Tungurahua, Ecuador
1660			Long Island, PNG ^T
1672	8	4	Merapi, Java, Indonesia
1711	12	11	Awu, Sangihe Is, Indonesia
1760			Makian, Halmahera Is, Indonesia
1772	8	12	Papandayan, Java, Indonesia
1775			Gamalama, Halmahera, Indonesia
1783	8	5	Asama, Honshu, Japan
1784	4		Grimsvotn, Iceland
1790	11		Kilauea, Hawaii, USA
1814	2	1	Mayon, Luzon, Philippines
1815	4	10	Tambora, Lesser Sunda Is, Indonesia ^T
1822	10	8	Galunggung, Java, Indonesia
1840	7	2	Ararat, Turkey
1845	2	19	Ruiz, Colombia
1856	3	2	Awu, Sangihe Is, Indonesia ^T
1875			Mayon, Luzon, Philippines
1883	8	27	Krakatau, Indonesia ^T
1892	6	7	Awu, Sangihe Is, Indonesia ^T
1902	5	7	Soufriere St. Vincent, West Indies ^T
1902	5	8	Pelee, Martinique ^T
1902	8	30	Pelee, Martinique ^T
1902	10	25	Santa Maria, Guatemala
1911	1	30	Taal, Luzon, Philippines ^T
1919	5	19	Kelut, Java, Indonesia
1930	12	18	Merapi, Java, Indonesia
1951	1	21	Lamington, New Guinea, PNG
1963	3	18	Agung, Lesser Sunda Is, Indonesia ^T
1982	3	29	El Chichon, Southern Mexico
1985	11	13	Ruiz, Colombia
1986	8	21	Oku Volcanic Field, Cameroon, Africa
1998	10	30	San Cristobal, Nicaragua
2006	11	30	Mayon, Luzon, Philippines
			1
			1,266

^T The eruption generated a tsunami

* Volcanic Explosivity Index: 2 = small, 3 = moderate-large, 4 = large, ≥ 5 = very large

** Total deaths includes eruption and subsequent indirect causes (e.g. famine and disease)

*** Deaths, but the actual number is not known

^L Based on legends

^R Rain triggered lahars, no eruption

Table 2. Significant volcanic eruptions with VEI ≥ 6			
Date			Deaths
Year	Mon	Day	Name, Location
-1610			Santorini, Greece ^T
-1460			Taupo, New Zealand
-1370			Pago, New Britain, PNG
-1050			Pinatubo, Luzon, Philippines
-250			Raoul Island, Kermadec Is, New Zealand
-100			Omkok, Aleutian Is, Alaska, USA
-50			Apoyeque, Nicaragua
50			Ambrym, Vanuatu
60			Bona-Churchill, Eastern Alaska, USA
230			Taupo, New Zealand
240			Ksudach, Kamchatka
450			Ilopango, El Salvador
540			Rabaul, New Britain, PNG
710			Pago, New Britain, PNG
800			Dakataua, New Britain, PNG
800			Bona-Churchill, Eastern Alaska, USA
930			Ceboruco, Mexico
1000			Changbaishan, Eastern China
1280			Quilotoa, Ecuador
1452			Kuwae, Vanuatu
1477	2		Bardarbunga, Iceland
1580			Billy Mitchell, Bougainville, PNG
1600	2	19	Huaynaputina, Peru
1660			Long Island, PNG ^T
1815	4	10	Tambora, Lesser Sunda Is, Indonesia ^T
1883	8	27	Krakatau, Indonesia ^T
1902	10	24	Santa Maria, Guatemala
1912	9	6	Novarupta, Alaska Peninsula, USA
1991	6	15	Pinatubo, Luzon, Philippines

^T The eruption generated a tsunami

* Volcanic Explosivity Index: 2 = small, 3 = moderate-large, 4 = large, ≥ 5 = very large

** Total deaths includes eruption and subsequent indirect causes (e.g. famine and disease)

*** Deaths, but the actual number is not known

^L Based on legends

Table 3. Volcanic eruptions that generated deadly tsunamis			
Date			Deaths
Year	Mon	Day	Name, Location
-1610			Santorini, Greece
766	7	20	Sakura-jima, Kyushu, Japan
1640	7	31	Komaga-take, Hokkaido, Japan
1741	8	23	Oshima-Oshima, Hokkaido, Japan
1781	4	11	Sakura-jima, Kyushu, Japan
1792	5	21	Unzen, Kyushu, Japan
1815	4	10	Tambora, Lesser Sunda Is, Indonesia
1856	3	2	Awu, Sangihe Is, Indonesia
1871	3	3	Ruang, Sangihe Is, Indonesia
1883	8	27	Krakatau, Indonesia
1888	3	13	Ritter Island, PNG
1911	1	30	Taal, Luzon, Philippines
1928	8	4	Paluweh, Lesser Sunda Is, Indonesia
1930	9	11	Stromboli, Italy
1937	5	29	Rabaul, New Britain, PNG
1965	9	28	Taal, Luzon, Philippines

* Volcanic Explosivity Index: 2 = small, 3 = moderate-large, 4 = large, ≥ 5 = very large

** Tsunami and eruption deaths could not be separated

*** Deaths, but the actual number is not known

^L Total of 60,000 deaths from the eruption and subsequent famine and disease, which includes 11,000 from the bomb impacts, tephra falls and tsunami

